Algebra 2

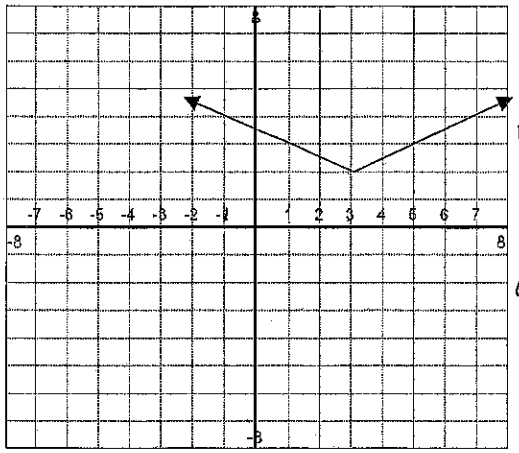
Midterm Review

ANSWER KEY

Name_____

Date_____ Per_____

1.) Determine the equation of the graph below:

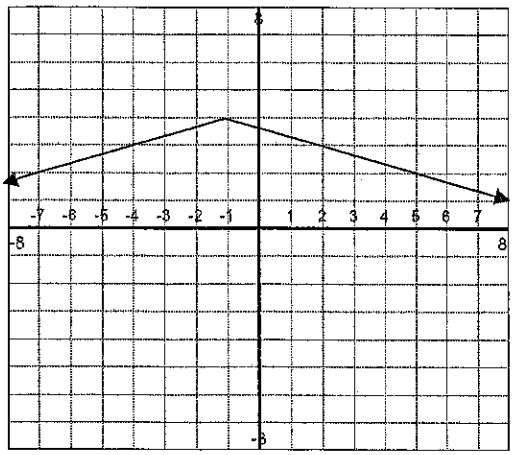


vertex (3, 2)

$a = \frac{1}{2}$

$y = \frac{1}{2}|x-3|+2$

1.) YOU TRY: Determine the equation of the graph below:



vertex (-1, 4)

$a = -\frac{1}{3}$

$y = -\frac{1}{3}|x+1|+4$

2.) Hertz Rent-A-Car charges a daily fee of $45 dollars a day and .30 cents for every mile. The local competition charges $35 a day and .50 cents for every mile. If you rent a car for 3 days and drive 300 miles, which company offers a better value?

Hertz

$45d + .30m$

$45(3) + .30(300)$

$\$225$

Local competition

$35d + .50m$

$35(3) + .50(300)$

$\$255$

Answer: Hertz

2.) YOU TRY: Hertz Rent-A-Car charges a daily fee of $55 and .20 cents for every mile. The local competition charges $25 a day and .59 cents for every mile. If you rent a car for 4 days and drive 250 miles, which is the better value?

Hertz

$55d + .20m$

$55(4) + .20(250)$

$\$270$

Local Competition

$25d + .59m$

$25(4) + .59(250)$

$\$247.50$

Answer: Local Competition

3.) Determine the zeros/roots/solutions of the following function:

$y = 2x^2 + 6x + 3$

$a = 2$, $b = 6$, $c = 3$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(2)(3)}}{4} = \frac{-6 \pm \sqrt{12}}{4}$$

$$\frac{-6 \pm 2\sqrt{3}}{4} = \frac{-3 \pm \sqrt{3}}{2}$$

Zeros: _____

3.) YOU TRY: Determine the zeros/roots/solutions of the following function:

$2x^2 + 39 = -18x$

$2x^2 + 18x + 39 = 0$

$a = 2$, $b = 18$, $c = 39$

$$x = \frac{-18 \pm \sqrt{(18)^2 - 4(2)(39)}}{2(2)} = \frac{-18 \pm \sqrt{12}}{4}$$

$$\frac{-18 \pm 2\sqrt{3}}{4} = \frac{-9 \pm \sqrt{3}}{2}$$

Zeros: _____

4.) Which of the following choices represents the following transformation

$y = |x|$ *to* $y = |x + 5| - 3$

a. Horizontal shift 5 units right, vertical shift 3 units down
b. Horizontal shift 5 units right, vertical shift 3 units up
c. Horizontal shift 5 units left, vertical shift 3 units down
d. Horizontal shift 5 units left, vertical shift 3 units up

4.) YOU TRY: Which of the following choices represents the following transformation

$y = x^2$ to $y = (x - 1)^2 + 7$

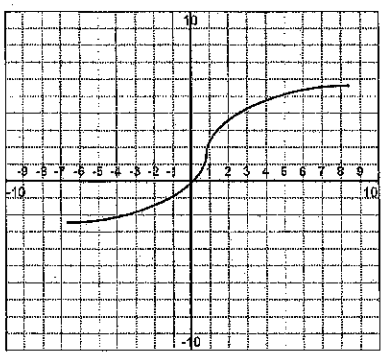
a. Horizontal shift 1 units right, vertical shift 7 units down
b. Horizontal shift 1 units right, vertical shift 7 units up
c. Horizontal shift 1 units left, vertical shift 7units down
d. Horizontal shift 1 units left, vertical shift 7 units up

5.) Which of the following relationships are functions?

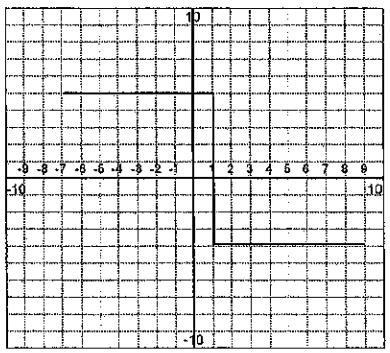
a. {(4,6), (5,2), (−4, 7), (3,6), (6,3)}

b. {(3, −6), (5,2), (−4, 7), (3,6), (2,5)}

c.



d.

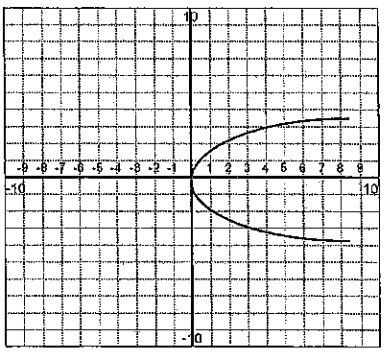


5.) YOU TRY: Which of the following relationships are functions?

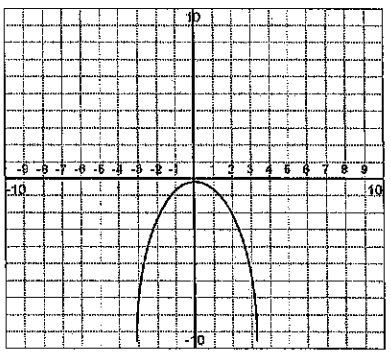
a. {(1, 2), (3, 4), (-1, -2), (-3, -4)}

b. {(1,2), (-1, 2), (1, 3), (-1, 3)}

c.



d.



6.) Determine the value of b if the solution to the equations is x = -13

$\frac{x^2 + bx + 6}{-2x + 7} = 12$

$\frac{(-13)^2 + (-13)b + 6}{-2(-13) + 7} = 12 \Rightarrow$

$\frac{169 - 13b + 6}{33} = 12 \Rightarrow \frac{175 - 13b}{33} = 12 \Rightarrow$

$175 - 13b = 396 \Rightarrow \frac{-13b}{-13} = \frac{221}{-13}$

b = -17

6.) YOU TRY: Determine the value of b if the solution to the equations is x = - 4

$\frac{x^2 + bx - 2}{3x - 5} = -2$

$\frac{(-4)^2 + (-4)b - 2}{3(-4) - 5} = -2 \Rightarrow$

$\frac{16 - 4b - 2}{-17} = -2 \Rightarrow \frac{14 - 4b}{-17} = -2 \Rightarrow$

$14 - 4b = 34 \Rightarrow \frac{-4b}{-4} = \frac{20}{-4}$

b = -5

7.) Given $f(x) = x^2 + 4x + 1$, which of the following is equivalent?

$x = \frac{-b}{2a} = \frac{-4}{2} = -2$

a. $f(x) = (x + 2)^2 + 3$

(b) $f(x) = (x + 2)^2 - 3$

c. $f(x) = (x - 2)^2 + 3$

d. $f(x) = (x - 2)^2 - 3$

$(-2)^2 + 4(-2) + 1 =$
$4 - 8 + 1 = -3$
vertex: $(-2, -3)$

7.) YOU TRY: Given $f(x) = x^2 + 6x + 3$, which of the following is equivalent?

$x = \frac{-b}{2a} = \frac{-6}{2} = -3$

a. $f(x) = (x + 3)^2 + 6$

b. $f(x) = (x - 3)^2 - 6$

c. $f(x) = (x - 3)^2 + 6$

(d) $f(x) = (x + 3)^2 - 6$

$(-3)^2 + 6(-3) + 3$
$9 - 18 + 3 = -6$
vertex: $(-3, -6)$

8.) What are the zero's of the following polynomial function $f(x) = x^4 - x^2 - 9x^2 + 9$ $\Rightarrow x^4 - 10x^2 + 9 = 0$

$\pm 1, \pm 3, \pm 9$

1)	1	0	-10	0	9
	↓	1	1	-9	-9
	1	1	-9	-9	0
-1)	↓	-1	0	9	
	1	0	-9	0	

$(x-1)$
$(x+1)$

$\Rightarrow x^2 - 9 = 0$
$(x-3)(x+3) = 0$

Zeros: $-3, -1, 1, 3$

8.) YOU TRY: What are the zero's of the following polynomial function $f(x) = x^4 - 25x^2 - 4x^2 + 100$

$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20, \pm 25, \pm 50$

$x^4 - 29x^2 + 100 = 0$

2)	1	0	-29	0	100
	↓	2	4	-50	-100
	1	2	-25	-50	0
-2)	↓	-2	0	50	
	1	0	-25	0	

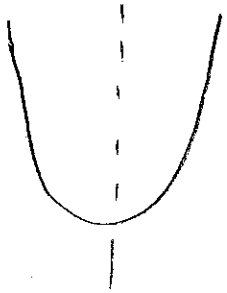
$(x-2)$
$(x+2)$

$\Rightarrow x^2 - 25 = 0$
$(x-5)(x+5)$

Zeros: $-5, -2, 2, 5$

9.) When is the function $x^2 - 3x - 18$ decreasing?

$x = \frac{-b}{2a} = \frac{3}{2}$

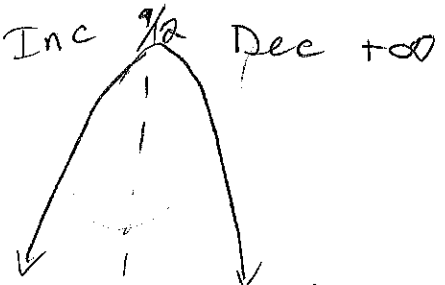


Decreasing: $(-\infty, \frac{3}{2})$ $x < \frac{3}{2}$

9.) YOU TRY: When is the function $-x^2 + 9x - 20$ increasing?

$x = \frac{-b}{2a} = \frac{-9}{-2} = \frac{9}{2}$

$-\infty$ Inc $\frac{9}{2}$ Dec $+\infty$



Increasing: $(-\infty, \frac{9}{2})$; $x < \frac{9}{2}$

~~Decreasing~~:

10.) Determine the value of x which would make the statement true.

$2i^3(5 + i) + 3i = 2 + xi$

$10i^3 + 2i^4 + 3i = 2 + xi$
$-10i + 2 + 3i = 2 + xi$
$2 - 7i = 2 + xi$
$-2 \quad -2$
$-7i = xi$
$\frac{-7i}{i} = \frac{xi}{i}$
$-7 = x$

a. x = 11
(b) x = -7
c. x = -2
d. x = 3

10.) YOU TRY: Determine the value of x which would make the statement true.

$-3i^3(3 + 2i) - 2i = -6 + xi$

$-9i^3 - 6i^4 - 2i = -6 + xi$
$9i - 6 - 2i = -6 + xi$
$-6 + 7i = -6 + xi$
$+6 \quad +6$
$7i = xi$
$\frac{7i}{i} = \frac{xi}{i}$
$7 = x$

(a) x = 7
b. x = -7
c. x = 1
d. x = -1

11.) Which of the following is equivalent to

$x^2 + 18x + 100 = 20$ $\Rightarrow x^2+18x+80=0$

$x=-\frac{b}{2a}=-\frac{18}{2}=-9$

$(-9)^2+18(-9)+80=$

$81-162+80=-1$

a. $(x+9)^2=1$ $(x+9)^2-1=0$

b. $(x+9)^2=-1$ $(x+9)^2+1=0$

c. $(x-9)^2=-1$ $(x-9)^2-1=0$

d. $(x-9)^2=-1$ $(x-9)^2+1=0$

11.) YOU TRY: Which of the following is equivalent to

$x^2 + 2x + 9 = 24$ $\Rightarrow x^2+2x-15=0$

$x=-\frac{b}{2a}=-\frac{2}{2}=-1$

$(-1)^2+2(-1)-15=$

$1-2-15=-16$

a. $(x-1)^2=16$ $(x-1)^2-16=0$

b. $(x-1)^2=-16$ $(x-1)^2+16=0$

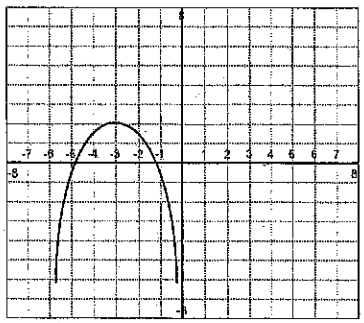
c. $(x+1)^2=16$ $(x+1)^2-16=0$

d. $(x+1)^2=-16$ $(x+1)^2+16=0$

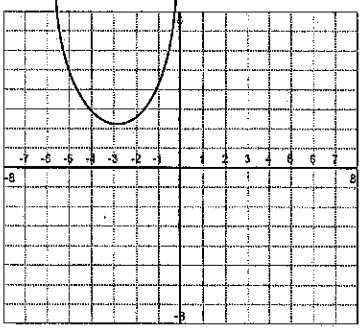
12.) Which of the following is the graph of

$f(x) = -(x-3)^2 + 2$

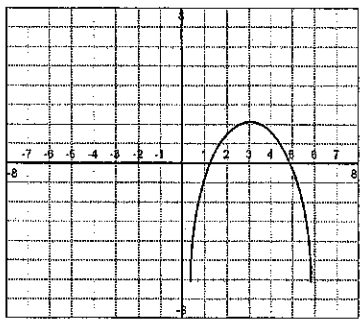
a.



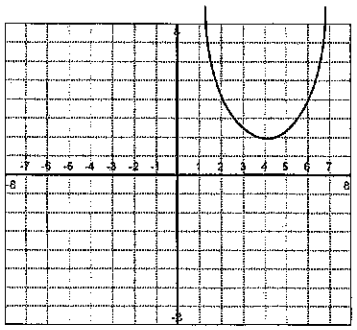
b.



c.



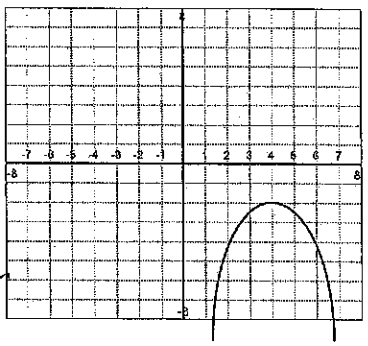
d.



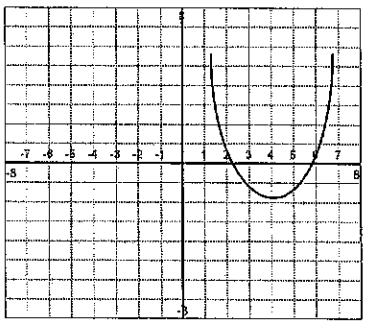
12.) YOU TRY: Which of the following is the graph of

$f(x) = (x+4)^2 - 2$

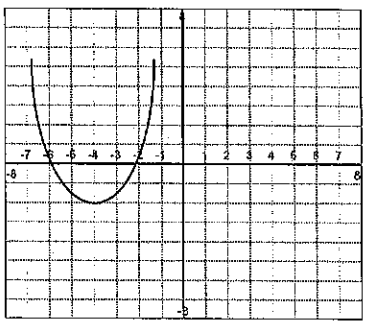
a.



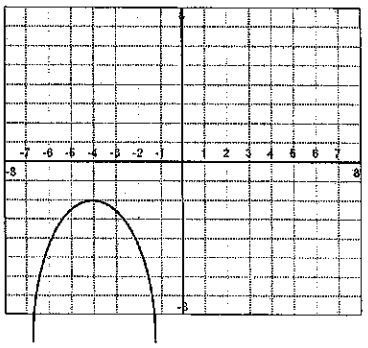
b.



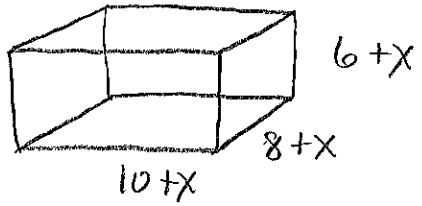
c.



d.



12.) A rectangular box has sides of lengths 6, 8 and 10. If each side is increase by x inches, determine the volume function that would model this rectangular box.



$(x+6)(x+8)(x+10)$

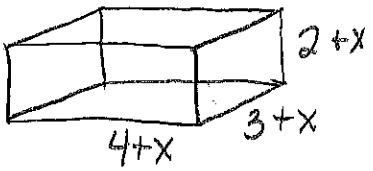
$(x^2+14x+48)(x+10)$

$x^3+14x^2+48x+10x^2+140x+480$

$x^3+24x^2+188x+480$

Volume: $x^3+24x^2+188x+480$

12.) YOU TRY: A rectangular box has sides of lengths of 2, 3, 4. If each side is ~~decreased~~ increased by x inches, determine the volume function that would model this rectangular box.



$(x+2)(x+3)(x+4)$

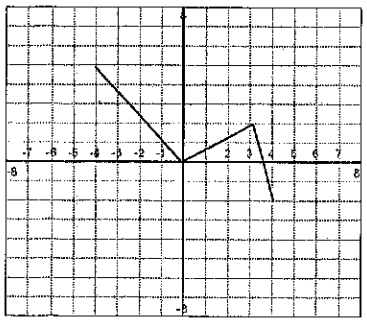
$(x^2+5x+6)(x+4)$

$x^3+5x^2+6x+4x^2+20x+24$

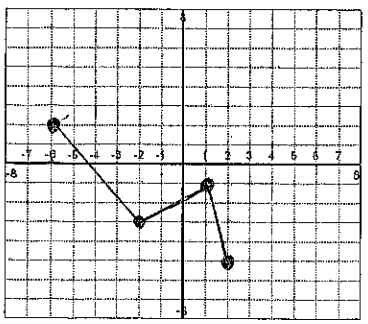
$x^3+9x^2+26x+24$

Volume: $x^3+9x^2+26x+24$

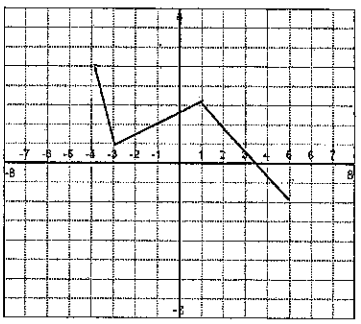
13.) The following graph is f(x), graph f(x + 2) – 3



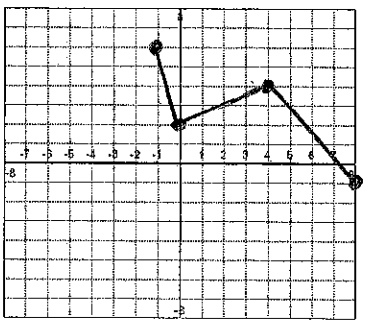
$(-4,5) \rightarrow (-6,2)$
$(0,0) \rightarrow (-2,-3)$
$(3,2) \rightarrow (1,-1)$
$(4,-2) \rightarrow (2,-5)$



13.) The following graph is f(x), graph f(x -3) + 1



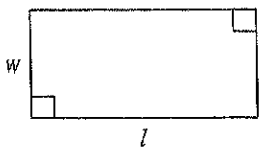
$(-4,5) \rightarrow (-1,6)$
$(-3,1) \rightarrow (0,2)$
$(1,3) \rightarrow (4,4)$
$(5,-2) \rightarrow (8,-1)$



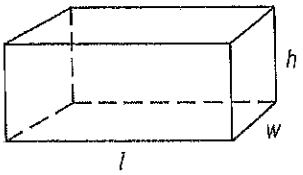
ALGEBRA II FORMULA SHEET

Formulas that you may need to solve questions on this exam are found below.
You may use calculator π or the number 3.14.

Shapes



$A = lw$



$V = lwh$

Data Analysis

Permutation: $_nP_r = \dfrac{n!}{(n-r)!}$

Combination: $_nC_r = \dfrac{n!}{r!(n-r)!}$

Exponential Properties

$a^m \cdot a^n = a^{m+n}$ $\qquad$ $(a^m)^n = a^{m \cdot n}$

$\dfrac{a^m}{a^n} = a^{m-n}$ $\qquad$ $a^{-1} = \dfrac{1}{a}$

Powers of the Imaginary Unit

$i = \sqrt{-1}$ $\qquad$ $i^2 = -1$

$i^3 = -i$ $\qquad$ $i^4 = 1$

Logarithmic Properties

$\log_a x = y \leftrightarrow x = a^y$ $\qquad$ $\log x = y \leftrightarrow x = 10^y$ $\qquad$ $\ln x = y \leftrightarrow x = e^y$

$\log_a(x \cdot y) = \log_a x + \log_a y$

$\log_a x^p = p \cdot \log_a x$

$\log_a \dfrac{x}{y} = \log_a x - \log_a y$

Quadratic Functions

General Formula: $f(x) = ax^2 + bx + c$

Standard (Vertex) Form: $f(x) = a(x - h)^2 + k$

Factored Form: $f(x) = a(x - x_1)(x - x_2)$

Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

when $ax^2 + bx + c = 0$ and $a \neq 0$

Compound Interest Equations

Annual: $A = P(1 + r)^t$

Periodic: $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$

Continuous: $A = Pe^{rt}$

A = account total after t years
P = principal amount
r = annual rate of interest
t = time (years)
n = number of periods interest is compounded per year